METHOD OF EVALUATING DEGRADATION OF ELECTRICAL SIGNALS

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REFERENCE TO THE RELATED APPLICATION

This application is filed under 37 CFR 1.53(b) and is a continuation application of the prior application No. 08/892,347. No new matter has been added to this application. Claims 1 through 4 are identical to the claims 1 through 4 in the application No. 08/892,347, with the exception of the following amendments:

1. In claim 1, step (d), the word "substantially" before the word "identical" is deleted.

2. In claim 1, the word "for" in the phrase "method for evaluation" is deleted and the word "of" is added in its place.

3. In claim 2, the word "for" in the phrase "method for evaluation" is deleted and the word "of" is added in its place.

4. In claim 3, the word "for" in the phrase "method for evaluation" is deleted and the word "of" is added in its place.

5. In claim 4, the word "for" in the phrase "method for evaluation" is deleted and the word "of" is added in its place.

BACKGROUND

The present invention is in the field of computer video systems. More particularly, the present invention relates to the method of visually testing video systems for degradation of video signals that pass through video systems.

Video systems may include a variety of video sources, including but not limited to computers, video cassette recorders, video cameras, and a variety of display devices,

including but not limited to CRT monitors, CRT projectors, LCD projectors, DLP projectors, or other video display devices. The video sources can generate video signals of many types, including but not limited to NTSC, PAL, SECAM, as well as the types produced by computers, such as composite, monochrome analog, RGB, RGBS, RGBHV, RGsB, RsGsB, and any additional video standards developed by IBM for personal computer compatible technology, including but not limited to CGA, EGA, VGA, and SVGA type signals and any other standards developed by industry associations like VESA.

Regardless of the specific types of video signals produced, video signals frequently require processing and manipulation before they reach video display devices. To this end, video switchers, video distribution amplifiers and other equipment, as well as various types of interconnecting cables, are frequently installed between video signal sources and video display devices.

Those ordinarily skilled in the pertinent arts will recognize that after video signals pass through such video system and reach video display devices, the quality of the video signals frequently degrade. The degree and type of degradation of a video signal depends upon the characteristics of components of the circuits through which the video signal is passing. The number of components and the individual characteristics of these components, as well as the characteristics and length of interconnecting cables used to connect said devices together determine the video signal degradation level.

In order to determine the extent to which a particular circuit degrades a video signal, as well as to determine how to compensate for the degradation, it is necessary to compare the original video signal generated by the source, with the video signal

received by a video display device after the video signal has passed through such circuit.

Conventionally, this is done by connecting a video display device to a video signal source and observing the original image generated by the original video signal on the screen of the video display device. The video display device can then be connected at the output of the video system and the degraded image generated by the video signal after passing through the video system can be compared to the original image before passing through the video system. A troublesome shortcoming of this method is that a person comparing these two images has to remember what the original image looked like because only one image is viewed at a time, and the original image is not displayed while the degraded image is observed.

It is also possible to use two monitors, one connected to the original video signal and displaying the original image and one connected at the output of the video system and displaying the degraded image. However, those skilled in the pertinent arts will recognize that this method requires close proximity between video signal sources and video display devices, which in many cases is not possible. In addition, different display characteristics of each monitor may provide inaccurate results. Alternatively, one can employ network analyzers which test video systems by measuring various bandwidth characteristics. However, those skilled in the pertinent arts will recognize that network analyzers, aside from being expensive, also require close proximity between video signal sources and video display devices, which in many cases is not possible. In addition, specially trained personnel are required to operate complex network analyzers, who are often in short supply, and expensive.

Accordingly, a clear need exist for an inexpensive and simple method of testing video systems for degradation of video signals that pass through video systems, as well as compensating for the degradation of the video systems in order to provide the highest quality image possible.

OBJECT AND SUMMARY OF THE INVENTION

The present invention is directed to the method of testing video systems for degradation of video signals after passing through video systems, in which the method meets the needs discussed above.

An additional object of the present invention is to provide a novel enhanced means of testing for degradation of signals, which overcomes the drawbacks of the prior art.

The method, which is the subject matter of this invention, comprises the steps of applying a first test video signal to an input of a video system (where computers, video cassette recorders, video cameras, or any other video signal sources are connected to the video system) in a way that images generated by the first test video signal are displayed only on a portion of a screen of a display device. This can be accomplished by a generator or any other means capable of generating signals which produce images only on portions of the screen, as opposed to images occupying the entire screen. The first test video signal is then passed through the video system and the image generated by the first test video signal, which has been subject to degradation, is displayed only on a portion of the screen of the video display device.

A second test video signal, acting as a reference signal, is generated identical to the first test video signal. The second test video signal is designed so that the image it produces will be displayed on a portion of the screen not occupied by the signal from the first generator. The second test signal, along with the first test signal are synchronized and combined by a special circuit and connected to the video display device. Those ordinarily skilled in the pertinent arts will recognize that in order for the second test video signal to be identical to the first test video signal, same can be, for example, calibrated to the first test video signal.

The image generated by the second test video signal, which has not passed through the circuitry that the first test signal has, therefore functions as a reference signal. The image of the second test video signal is then displayed only on a portion of the screen of the display device, other than that portion of the display device on which said degraded image is displayed. It is most convenient, but not necessary, to display the degraded image and the reference image side by side on the screen of the video display device. For example, the reference image can occupy the left side of the screen, and the degraded image can occupy the right side of the screen of the video display device. (Alternatively, the degraded image and the reference image can be displayed on top and bottom of the video display device.) By visually comparing the two images simultaneously displayed on different portions of the screen of the video display device, it is easy and convenient to determine the extent to which the video signal degraded after passing through the video system. It should be apparent to those skilled in the pertinent arts that both generators of test video signals used for this type

of testing can have the ability of adjusting positions and sizes of images used for comparison.

BRIEF DESCRIPTION OF THE DRAWINGS

The advantages of the present invention will become better understood with reference to the following description of preferred embodiments of the invention, appended claims, and accompanying drawing figures in which the same reference numeral indicates the same feature, or features which are analogous in structure or function.

Fig. 1 provides a schematic presentation of a video system to which the method embodying the present invention are applied.

Fig. 2 provides a schematic presentation of the steps of testing video systems for degradation of signals by comparing reference and degraded images according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE PRESENT INVENTION

Throughout the following detailed description, it should be understood by those skilled in the pertinent arts, that references to electrical communication shall not be limited to communications performed entirely by electrical means, but shall be understood that some portions of the overall communications of the electrical signals may be performed by other means, including but not limited to optical, RF, ultrasound, magnetic, microwave, acoustic and other signals and means now known to those skilled in the pertinent arts or later developed.

The initial discussion of the preferred embodiment shall be made by reference to Fig. 1. Starting on the left hand portion of Figure 1, there is initially provided a Video Signal Source **10** which is placed in electrical communication with the first end of Cable **30** at Junction **A**. Video Signal Source **10**, which in this embodiment is shown as a computer, could be any number of other video sources producing a wide variety of types of video signals.

For example, Video Signal Source **10** could be a video camera, a video cassette recorder (VCR), a video tape recorder, a video disc player, a DVD, and any number of other video signal sources which are known to those ordinarily skilled in the pertinent arts. Cable **30** represents any number of possible means for conducting a video signal, including but not limited to a coaxial, fiber optic, and twisted pair cable. Cable **30** conducts the video signal from Video Signal Source **10** to Intermediary Circuit **20** which comprises any number of possible circuit elements. Intermediary Circuit **20** is generally composed of devices for processing and manipulating video signals, which may include distribution amplifiers, matrix switchers, interfaces and any number of other devices which are known to those ordinarily skilled in the pertinent arts.

The output of Intermediary Circuit **20** is placed in electrical communication with a second Cable **30**, which conducts the video signal to Junction **B** which is in electrical communication with Video Display Device **40.** The video signal generated by Video Signal Source **10** is displayed in some visual manner by Video Display Device **40.** As shown in Fig. 1, Video Display Device **40** is a computer monitor, although other video display devices, such as TV monitors, projectors, LCD displays, DLP projectors, and a number of other devices are possible.

Junction **A** is usually located in close proximity to the Video Signal Source **10**. Junction **B** is usually located in close proximity to the Video Display Device **40**. All of the circuitry and cables located between Junction **A** and Junction **B** represent the circuit that is being evaluated. No electronic circuitry can perfectly duplicate or process a video signal. Thus the video signal present at Junction **B** will be in some manner degraded or inferior to the signal at Junction **A** which was generated by Video Signal Source **10**. The method of the instant invention is used in conjunction with the circuitry, components and cables of the system shown in Fig. 1 and enable a person to visually estimate a level of degradation and compensate for the degradation and alteration of a video signal after passing through Intermediary Circuit **20**.

Referring now to Fig. 2, a method will now be explained which permits the basic circuit as shown in Figure 1, to be evaluated. As part of the evaluation method described for Fig. 2 and all other figures, the normal video source is removed and a test signal is used for evaluation. Once the evaluation has been completed, the usual video source can be returned to the circuit.

Starting at the left side of Fig. 1, there is provided a Video Signal Source **10**. However, in this test situation, Video Signal Source **10** has been removed from electrical communication at Junction **A** during the evaluation steps. Instead, First Test Generator **50**, is placed in electrical communication with Junction **A.** First Test Generator **50** is capable of generating video signals which produce images only on selected portions of a video display screen, as opposed to producing images which occupying the entire screen. In addition, First Test Generator **50** is designed to

produce signals that have characteristics identical to those produced by Video Signal Source **10**.

The circuitry as shown in Fig. 2, between Junction **A** and Junction **B**, is identical to the circuitry between Junction **A** and Junction **B** as shown in Fig. 1.

However, in the circuit as shown in Figure 2, Junction **B** is not placed in electrical communication with a video display device, but rather with Video Synchronizer **70**. A Second Test Generator **60** is also placed simultaneously in electrical communication with Video Synchronizer **70**.

Video Synchronizer **70** receives input directly from Second Test Generator **60** and indirectly from First Test Generator **50**, after the video signal has been processed by the circuitry between Junction **A** and Junction **B**. Because the video signals generated are from different sources, they will not be synchronized when generated. The purpose of Video Synchronizer **70** is thus to not only combine the video signals but to synchronize them as well, so that they can be properly displayed on Video Display Device **40.** However, as should be apparent to those knowledgeable in the pertinent arts, it is simply more convenient, but not necessary to use one device, such as Video Synchronizer **70**, for both synchronizing and combining video signals. Synchronizing can be accomplished by a variety of means. For example, First Test Generator **50** and Second Test Generator **60** can be connected to a separate means of synchronizing the video signals.

The output of Video Synchronizer **70** is placed in electrical communication with Video Display Device **40**. First Test Generator **50** and Second Test Generator **60** are designed so that the signal from each of them is displayed on separate portions of

Video Display Device **40.** In Figure 2, the signal that originated from First Test Generator **50** is shown as Image **50a.** Image **50a** represents a signal that has been degraded or altered by passing through the circuitry located between Junction **A** and Junction **B**. The signal that originated form Second Test Generator **60** is shown in the figure as Image **60A** and represents an unaltered or reference image.

It is within the scope of the invention, that the video signals coming from First Test Generator **50** and Second Test Generator **60**, can be modified so that each image that results from each signal, can be displayed in a plurality of sizes and in any possible position on the video display screen.

By observing Image **50a** and Image **60a** on Video Display Device **40,** it is easy and convenient to determine the extent to which the video signal degrades after passing through the video system represented by the circuitry between Junction **A** and Junction **B**. Those ordinarily skilled in the pertinent arts will recognize that additional monitors, oscilloscopes or a number of other devices capable of displaying images generated by video signals can be connected instead of or in addition to the Video Display Device **40,** for the purpose of observing and comparing the Image **50a** and the Image **60a**.

In short, Figure 2 shows how the basic system as described in Figure 1 can be modified to permit the visualization of a degraded video signal and a reference video signal simultaneously on the same video display device.

While the present invention has been described and defined by reference to the preferred embodiment of the invention, such reference does not imply a limitation on the invention, and no such limitation is to be inferred. The invention is capable of

considerable modification, alteration, and equivalents in form and function, as will occur to those ordinarily skilled in the pertinent arts.

The depicted and described preferred embodiment of the invention is exemplary only, and is not exhaustive of the scope of the invention. Consequently, the invention is intended to be limited only by the spirit and scope of the appended claims, giving full cognizance to equivalents in all respects. Specifically, those ordinarily skilled in the pertinent arts will recognize that the present invention, or its equivalents, is not limited to video signals, but can be used with any type of signals that can be visually represented and which degrade due to passing through components of a system.